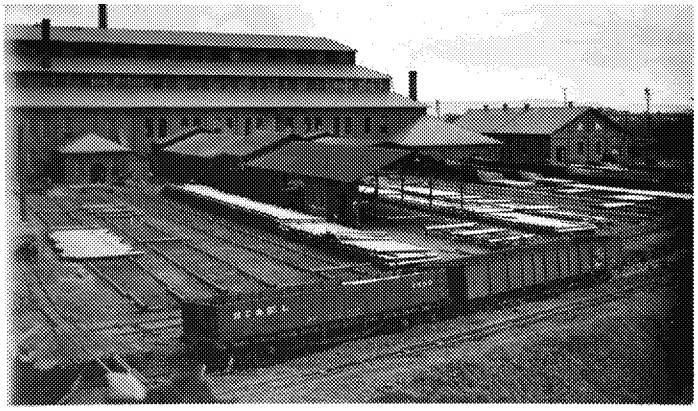
SOUTHSIDE CHATTANOOGA LEAD SITE & CHILDREN'S HEALTH

Sydney Chan, MPH



FORMER CHATTANOOGA FOUNDRIES

60+ foundries historically located in Chattanooga.

Foundries generated spent sand and baghouse dust over many decades.

Historically, many foundries operated in Chattanooga
60+ foundries in the city of Chattanooga, starting in 1880s until about 1980. Mostly iron, brass, bronze.
Huge amounts of spent foundry sand and bag-house dust were generated as unwanted byproducts.

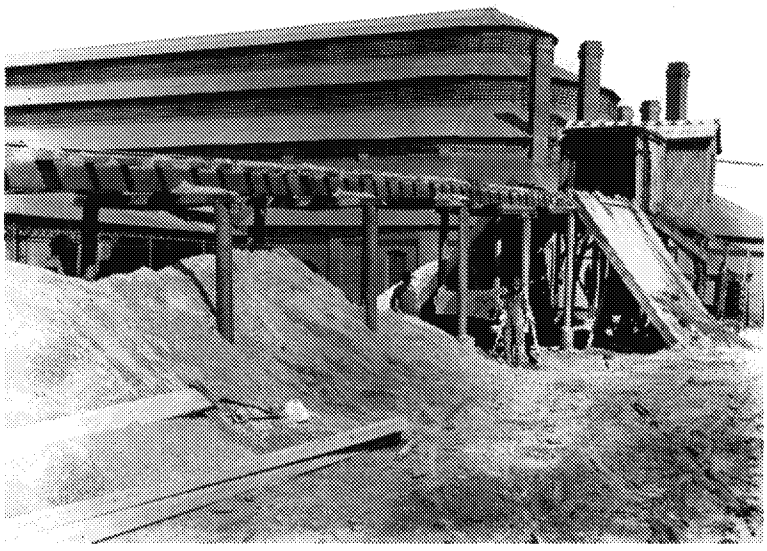
Chattanooga was a highly industrial city in the first half of 1900s – with one of the country's worst air pollution problems in mid century.

Many foundries historically located in Chattanooga.
Foundries generated huge amount of waste (foundry sand, baghouse dust) over many decades.

Continue to next slide (picture of dark material)

Material used as fill in flood plains, and as "top soil" in various parts of town, including residential areas.
Native soil is low in Pb; light to medium tan/orange.
Foundry waste is heterogeneous, but often has high levels of Pb.
Foundry waste is dark, loamy, with "coffee-ground" appearance. Visual evidence.

FORMER CHATTANOOGA FOUNDRIES



Foundries generated huge amount of waste (foundry sand, baghouse dust) over many decades.
Foundry waste can contain lead

Material used as fill in flood plains, and as “top soil” in various parts of town, including residential areas.

PREVIOUS EPA INVOLVEMENT

- 2011: resident presented at ER with lead poisoning
- 2011: EPA removal assessment
- 2012-2013: EPA removal at 84 residences in Read Avenue area
- Limited geographic area
- Extent of contamination beyond removal areas (if any) unknown

2011 resident on Reed Avenue went to emergency room, tested positive for high blood Lead
May and October 2011: EPA sampling and removal assessment
September 2012-December 2013: EPA time-critical removal conducted at 84 residences in Read Avenue neighborhood.
Limited to one geographic area.
Extent of contamination undefined.

In 2011, a resident went to the emergency room presenting with severe fatigue and abdominal pain.
Blood tests revealed lead levels approaching 20 micrograms per deciliter (µg/dL).

May 2, 2011, SESD and TDEC collected 11 composite surface soil samples from 10 properties on Reed Avenue. Lead exceeded RAL at 2 locations at 580 and 2,500 mg/kg. Removal assessment sampling at 14 properties in October 2011-8 exceeded RAL ranging to 980 mg/kg. The samples collected during this investigation were
composed of a coarse black material, presumably a mix of foundry sand, coke, slag, and coal, generally
found beneath several inches of reddish clayey overburden

235 locations in 17 neighborhoods were screened for Lead and Arsenic. Of the 235-25 exceeded RAL for Lead and 5 for Arsenic.
Highest Lead was 2852 and Arsenic was 129 mg/kg

8,200 lbs of soil removed from 84 residences

Foundry waste is dark, loamy, with “coffee-ground” appearance.
Native soil is low in Pb; light to medium tan/orange.
Visual evidence.

UNFINISHED BUSINESS?

During removal action, EPA became aware that additional areas may be similarly impacted

- Recon
- Anecdotal

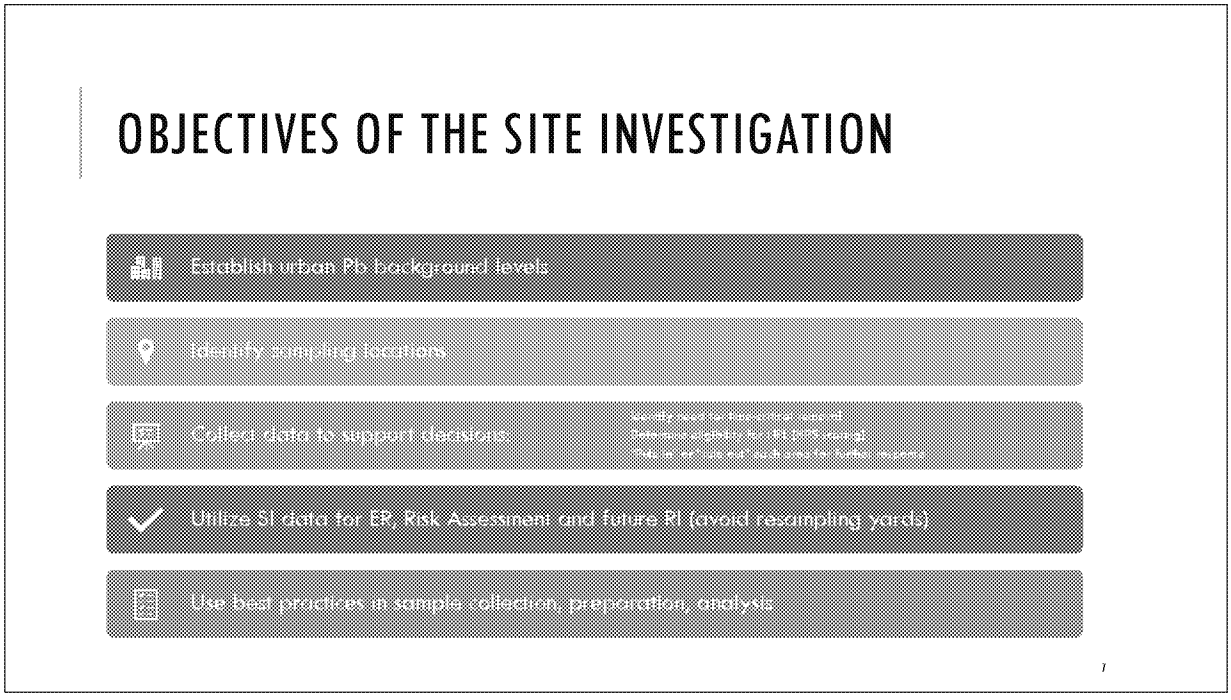
TDEC raised concerns about lead-contaminated foundry waste potentially located in other residential areas

- TDEC data from Brownfields and local development projects, state voluntary oversight program

Tennessee Department of Health data indicating a *relatively* high % of children with elevated blood lead *(in some neighborhoods compared to surrounding areas)*.

Blood lead data by zip code is not detailed or focused enough to use for decision purposes. Too large an area.

Recon study was cursory screening. Some neighborhoods treated more thoroughly than others.



We knew urban background would be very important for lead and arsenic, and possibly PAHs.

Also benefits to adding Chattanooga to the urban background body of data along with 6 or 7 other Reg 4 cities.

Most fundamentally – are we dealing with a cercla release, or merely anthropogenic background?

Best science, best practices – cost more than typical grab samples, but would be worth it if data could also be used for removal assessment and the future RI.
OLEM sieving guidance

Also interested in using xrf, but needed to ensure/demonstrate that the FOG would produce quality data.

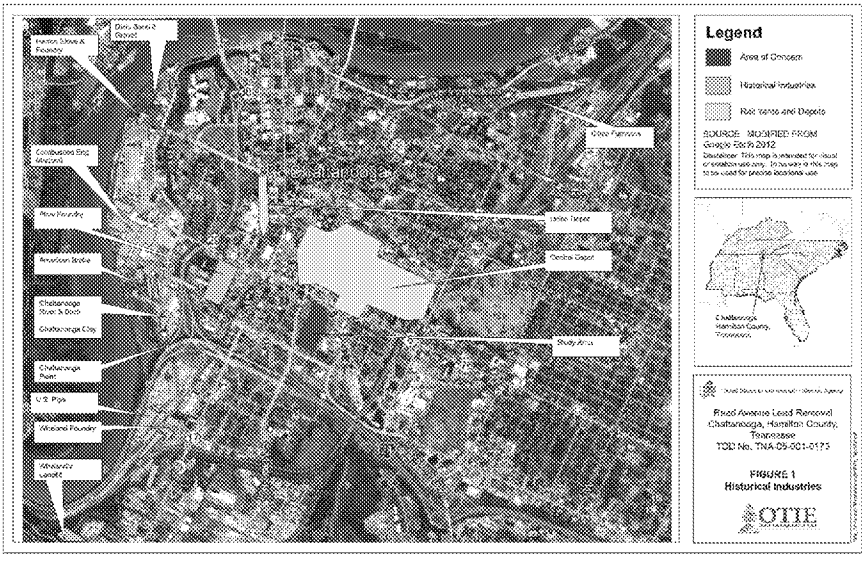
Focus on human health and the geographic locations where residents, especially children may be most at risk.

EPA brought together several sources of information and data to narrow the focus of concern. No, not all of Chattanooga requires investigation!

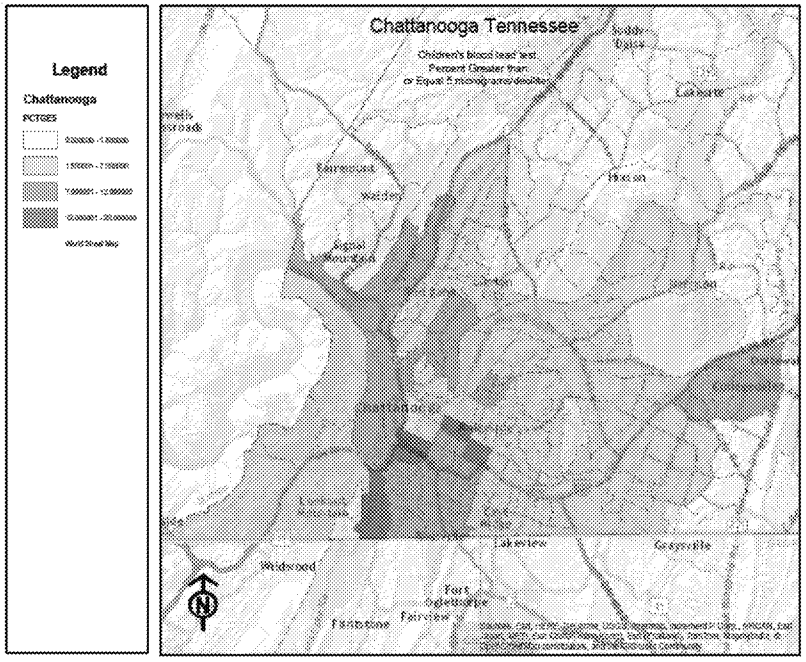
EPA worked with the TN DoH epidemiologist, TDEC, ATSDR liaison, in-house experts

EXISTING DATA: DOWNTOWN CHATTANOOGA

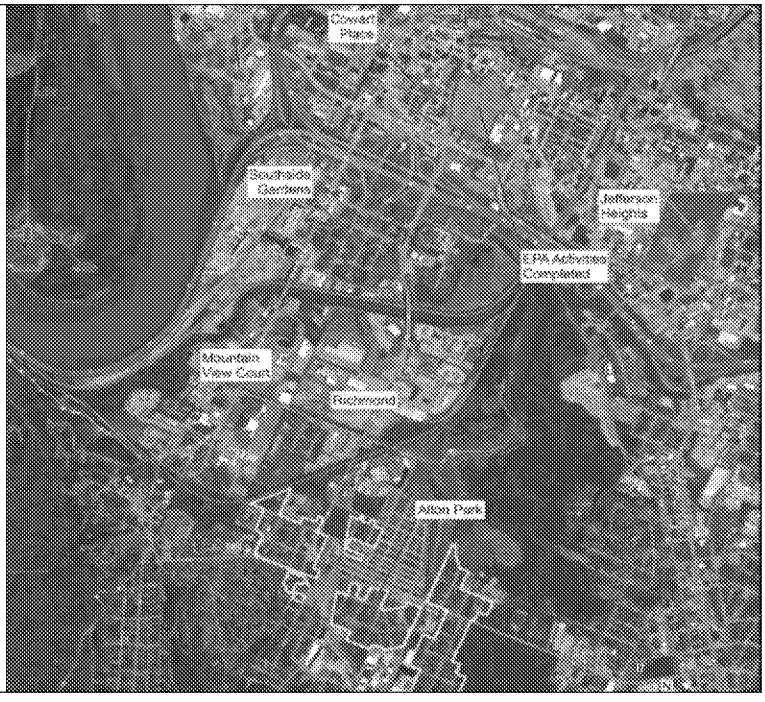
Historical Information

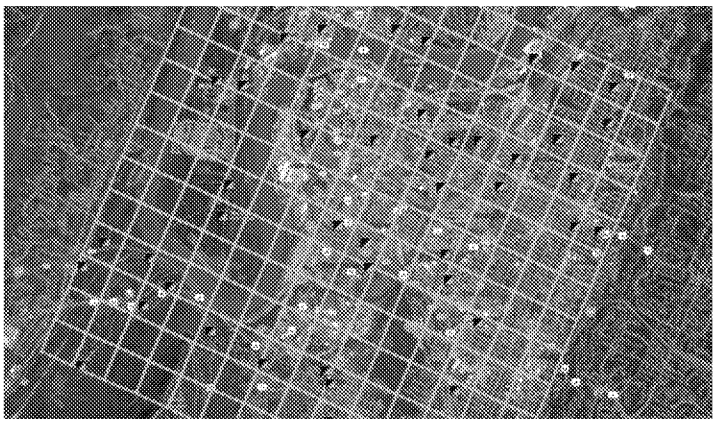


BLOOD-LEAD LEVELS BY CENSUS TRACT



RESULT: IDENTIFICATION OF SEVEN PRIORITY AREAS

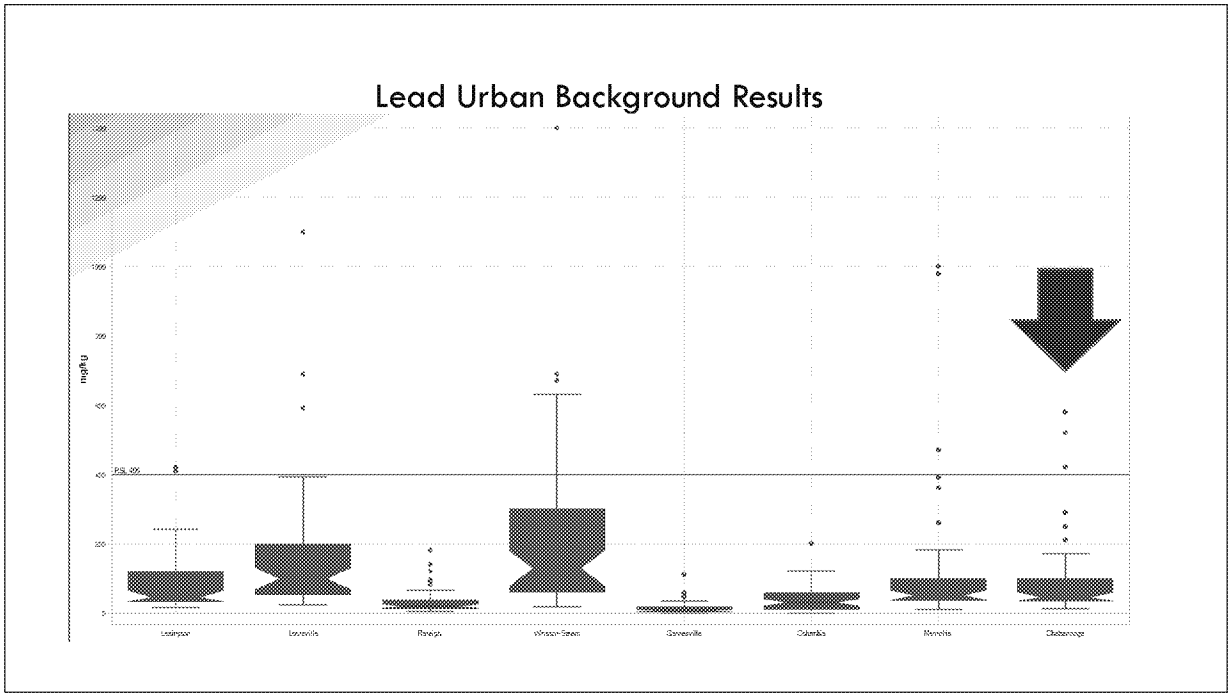




ESTABLISH CHATTANOOGA URBAN BACKGROUND LEVEL FOR LEAD

- Used SAP/QAPP template from larger R4 urban background study
- 5x5 mile grid; 50 randomly selected cells
- Excluded flood plain areas, study areas, known industry
- Piloted "best practices sampling and analytical" methods

50 samples collected from randomly selected cells. Metals and PAHs.



Chattanooga: urban lead concentration are in line with urban background in other R4 cities.
Too small to read, but this is just a quick look at how urban background of lead in soils Chattanooga compares with other cities in the southeast.

BEST SAMPLING & ANALYTICAL PRACTICES

Sought lessons learned from similar Region 4 sites

Sought lessons learned from other regions

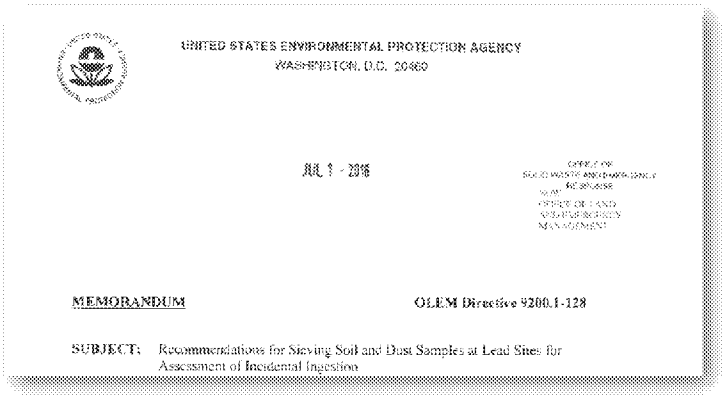
- Region 8 – Pueblo Smelter Site
- Region 10 – Bunker Hill Site

Considered new OLEM Guidance

- Sieving
- *In Vitro* Bioavailability

Considered draft Region 4 XRF Field Operations Guide

OLEM LEAD SIEVING DIRECTIVE



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUL 1 - 1998

MEMORANDUM

OLEM Directive 9200.1-128

SUBJECT: Recommendations for Sieving Soil and Dust Samples at Lead Sites for Assessment of Incidental Ingestion

Recommendations for Sieving Soil and Dust Samples at Lead Sites for Assessment of Incidental Ingestion

This directive was issued while the study was being designed.

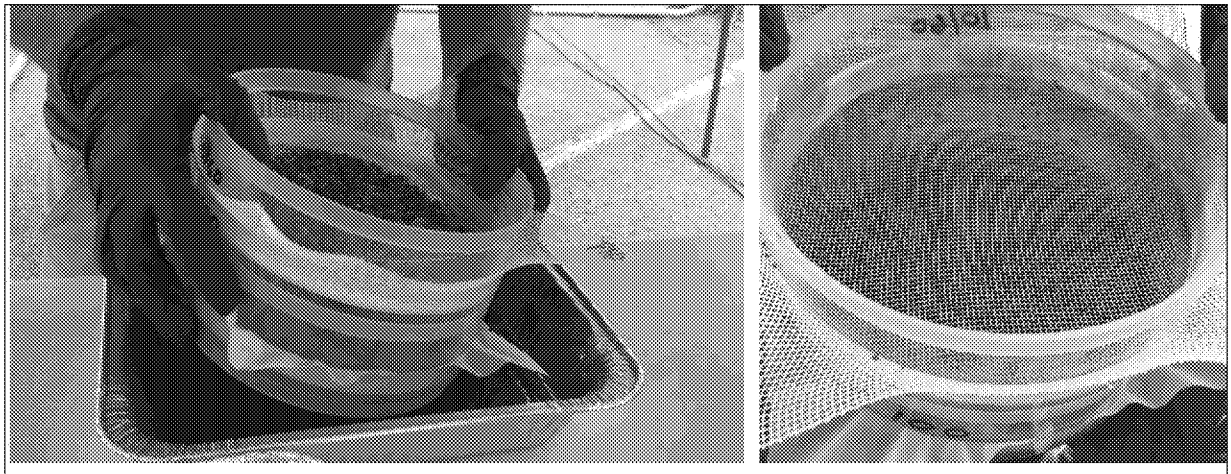
Lead can concentrate in fine particles
People are exposed to fine particles through ingestion of fine dust (sticks to fingers, pet paws, etc.)
Lead bioavailability analysis requires fine soil fraction.
IEUBK model uses data from fine fraction to calculate a site-specific cleanup level.
Sieving will be needed at some point for the risk assessment; we choose to do sieving in the pre-remedial phase to support decision making about the need for removal and the necessity of listing.

OLEM LEAD SIEVING DIRECTIVE

- Lead TRW recommends < 150 µm particle size.
- Incidental ingestion greater for fine particles.
- Dermal adherence greater for fine particles.
- Increased contaminant concentration, mobility, and bioavailability in fine particles.

DERMAL ADHERENCE

This picture demonstrates that fine fraction soil adheres to surfaces



SIEVE OF STACKED MESH (#10 AND #100)

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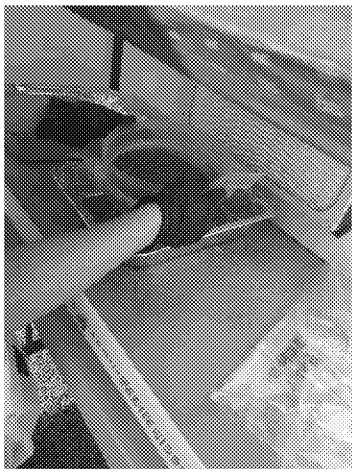
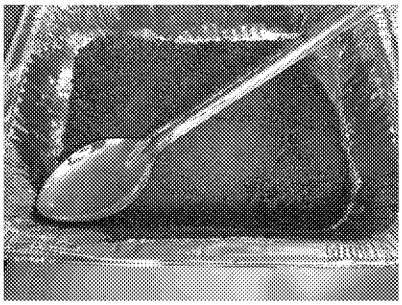
#10 sieve (to remove sticks, stones, etc.)
#100 sieve == 150 microns == separates coarse fraction from fines.

Disposable polyester mesh. Decon the rings between samples.

FIELD FUME HOOD



DISAGGREGATION AND DRYING



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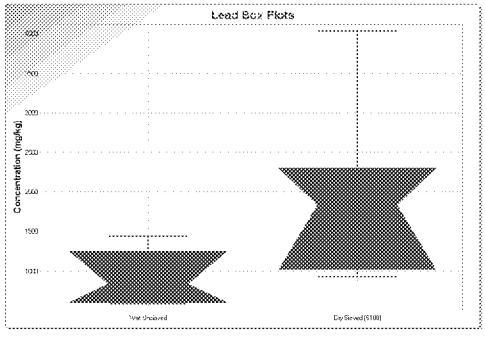
After collecting samples using ISM, the samples were dried (per R4 XRF FOG). Drying also expedited sieving.

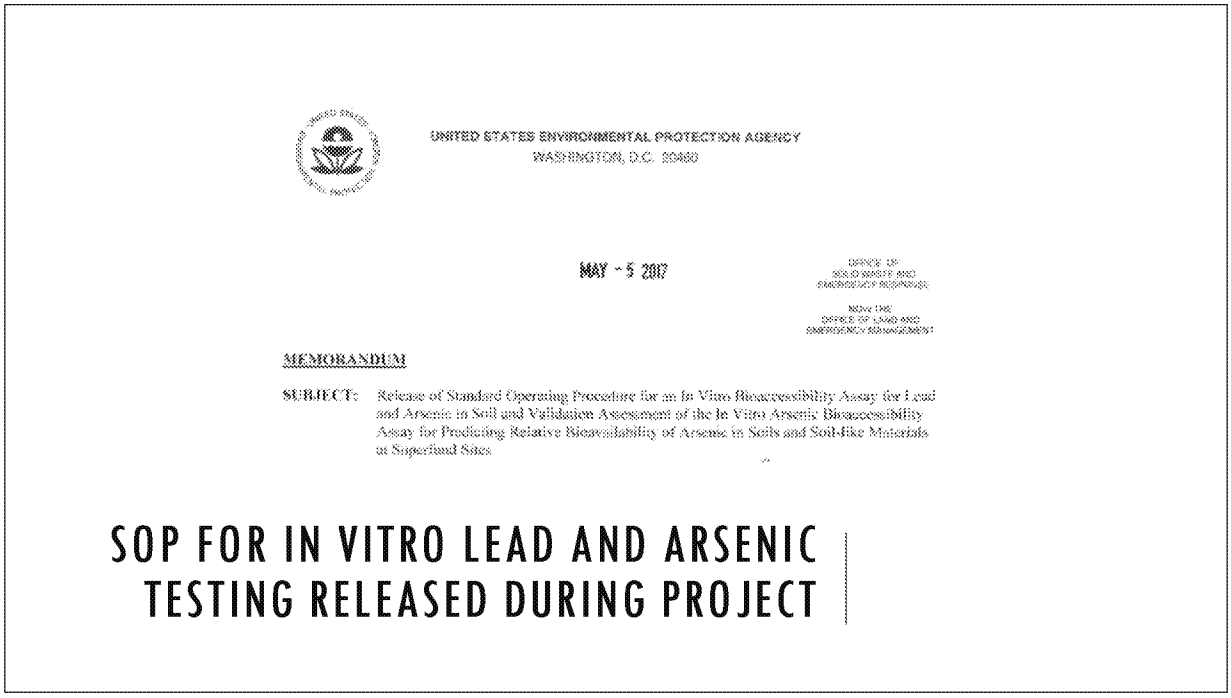
FINE FRACTION
<150 MICRONS

Resulting fine fraction of soil

FOUNDRY SAND: SIEVED VS UNSIEVED

Unsieved	Sieved
603	1016
837	1832
1434	4021
1245	2300
591	936





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAY - 5 2017

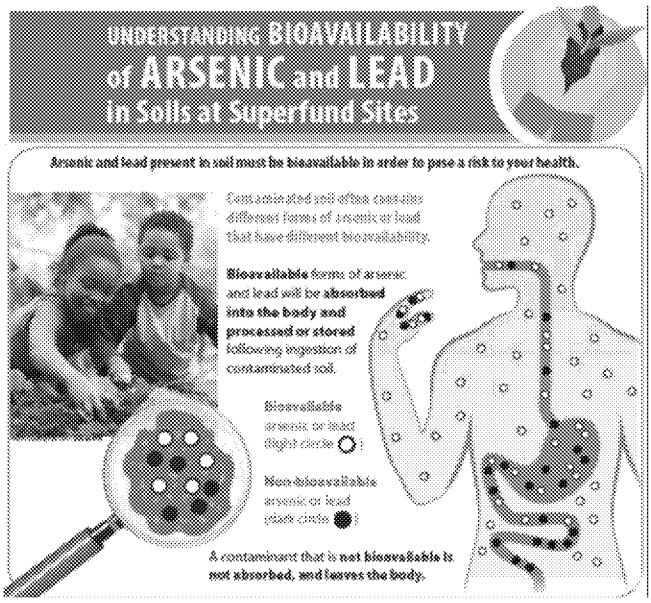
OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE

NOW THE OFFICE OF LAND AND EMERGENCY MANAGEMENT

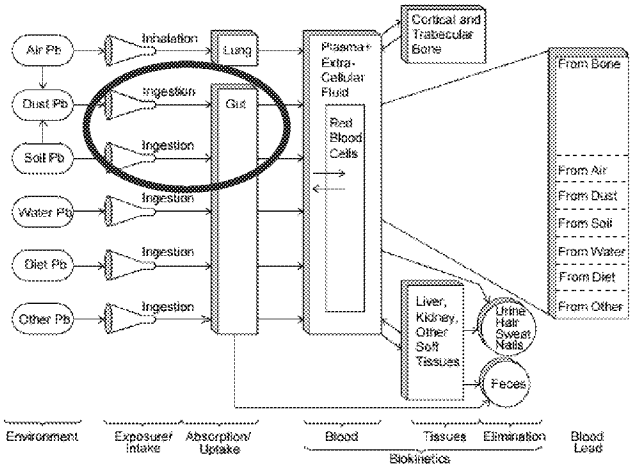
MEMORANDUM

SUBJECT: Release of Standard Operating Procedure for an In Vitro Bioaccessibility Assay for Lead and Arsenic in Soil and Validation Assessment of the In Vitro Arsenic Bioaccessibility Assay for Predicting Relative Bioavailability of Arsenic in Soils and Soil-like Materials at Superfund Sites

SOP FOR IN VITRO LEAD AND ARSENIC TESTING RELEASED DURING PROJECT


UNDERSTANDING BIOAVAILABILITY
of ARSENIC and LEAD
in Soils at Superfund Sites
Arsenic and lead present in soil must be bioavailable in order to pose a risk to your health.
Contaminated soil often contains different forms of arsenic or lead that have different bioavailability.
Bioavailable forms of arsenic and lead will be absorbed into the body and processed or stored following ingestion of contaminated soil.
Bioavailable arsenic or lead (light circle)
Non-bioavailable arsenic or lead (dark circle)
A contaminant that is not bioavailable is not absorbed, and leaves the body.

BIOAVAILABILITY INFORMS RISK & CLEAN-UP GOALS



What is going on behind the scenes of the IEUBK model. This is where we adjust the IEUBK model if we have site-specific IVBA information

LEAD BIOAVAILABILITY

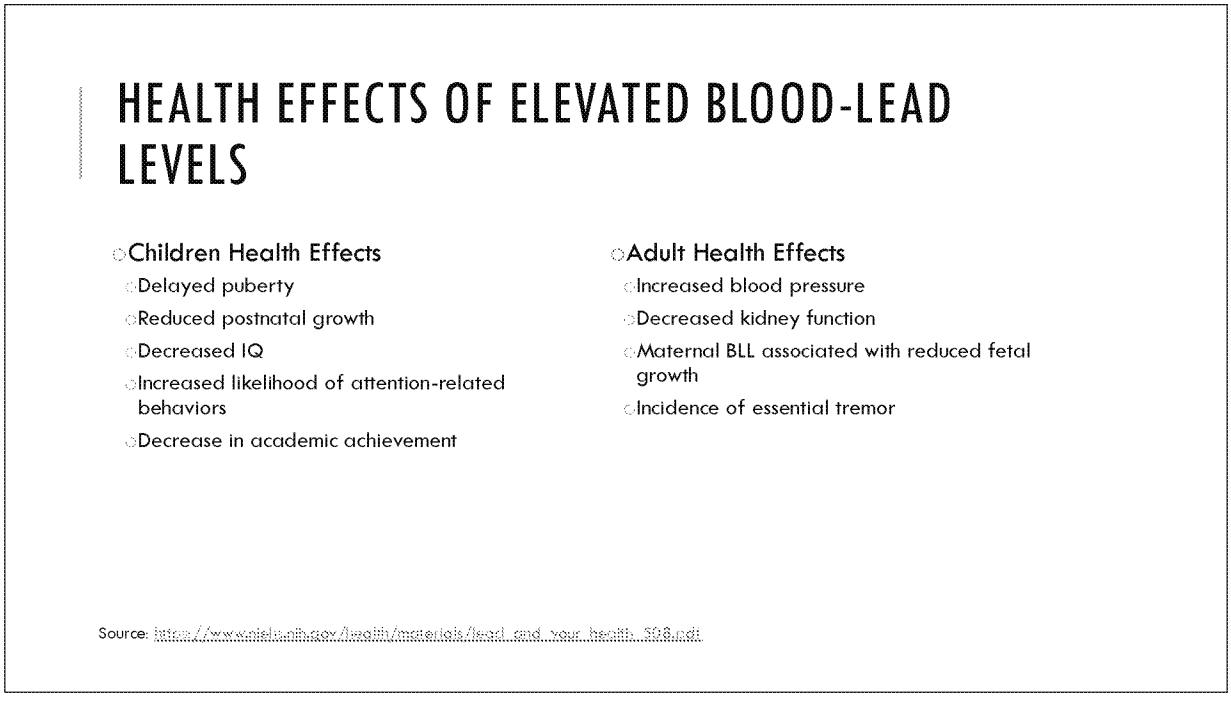
33 soil samples were analyzed for lead bioavailability

IEUBK default BA = 30%

Chattanooga site soils BA = 29-50%, avg. = 36%

↑BA will ↓ health-based remedial level

Site specific cleanup levels: < 400 ppm to *well below background levels*, depending on target blood lead level used in model; 360 ppm

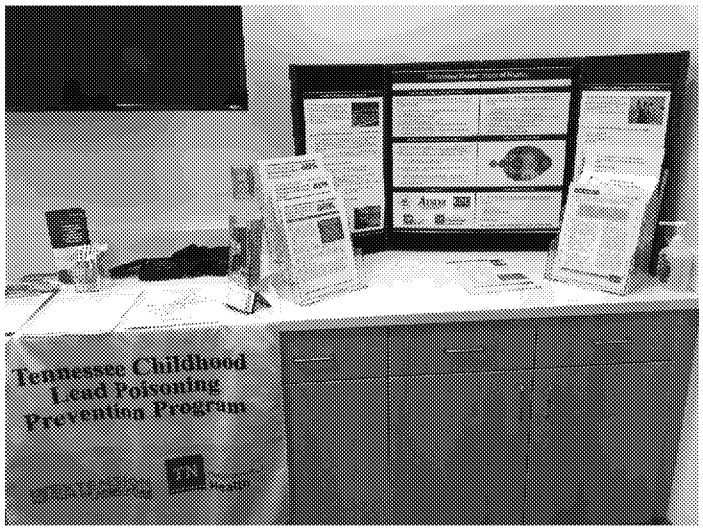


Concerned given the high BLL by census tract

PARTNERSHIPS DEVELOPED TO HELP TACKLE BLL

Throughout the project we have been working with the state and county public health departments (TN Dept of Health, TDEC lead program, Tennessee Childhood Lead Poisoning Prevention Program)

- Outreach at Grand Rounds at local hospitals in Chattanooga
- Educational outreach materials available at the public library



MORE INFORMATION OF BLOOD-LEAD

- CDC Lead Homepage
  - https://www.cdc.gov/nceh/lead/default.htm
- Blood Lead Levels in Children Fact Sheet
  - https://www.cdc.gov/nceh/lead/acclpp/lead_levels_in_children_fact_sheet.pdf
- Site Information
  - https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0410686
- XRF Field Operations Guide
  - https://www.epa.gov/risk/regional-4-superfund-x-ray-fluorescence-field-operations-guide

QUESTIONS?

QUESTIONS

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